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COMMITTEE OF EXPERTS ON THE
TRANSPORT OF DANGEROUS GOODS

**Sub-Committee of Experts on the
Transport of Dangerous Goods
(Fourteenth session,
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agenda item 2 (c))**

DRAFT AMENDMENTS TO THE MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

Other packaging and IBC matters

Leakproofness tests for aerosols and small receptacles for gas

Transmitted by the Expert from Germany

1. Introduction

The hot water bath has been part of the testing of pressure receptacles since the beginning of the industrial mass production about 50 years ago. This test method has been applied unchanged ever since then.

The testing of the leaktightness and integrity of filled pressure receptacles by this method has led to an accepted level of quality and safety during storage, transport and handling.

Any improvement in the performance of the hot water bath was fully under the responsibility of the filler. However, also this test method does include certain unsufficiencies related to safety, ecology and economy.

Insufficiencies with respect to safety may be seen in the missing detection time, which results in an unspecified sensitivity of the test method. The necessary detection time for leaking receptacles is in the range of several seconds in typical serial productions. As far as the detection of leaking receptacles is performed visiually, scientific investigations have shown a high degree of unreliability (rapid loss of attention).

Critical with respect to ecology are the considerable consumption of energy to heat the water bath and the expenses for the water volume, contaminated by leaking receptacles.

The application of complex quality management systems, which include overlapping quality controls of semiproducts and purchased articles, executed usually outside the filler companies makes the application of the hot water bath increasingly uneconomic, particularly where leak detection relies on employees.

Methods alternative to the hot water bath have been made available as part of modern quality management procedures. These procedures include quality controls of the manufacturing of the components of the receptacles on one hand those of its assembly by the filler.

Alternative leaktightness-test methods have been applied in Germany since serveral years with very large numbers of pressure receptacles, both, on one piece aluminium and on three pieces light gage metal receptacles. The alternative method applied is based on the sensitive measurement of the pressure differential in a test cap put on top of the filled receptable at room temperature.

The sensitivity of the pressure measurement is determined by a leakage rate, 5 times smaller then those of water bath test. This factor compensates the lower internal pressure due to the performance at room temperature (The sensitivity in terms of the leakage rate of the water bath test at the actual state of the art is considered to be 10^{-2} mbar l/s for this comparison, equivalent to two bubbles per second, with a diameter of 2 mm).

This alternative method of leaktesting is accompanied by a 100 % mass control of receptacles to account for the fact, that the main reason for the occasional failure of receptacles is mostly due to its overfill. The procedures are completed by quality controls of semiproducts and components, and, above all, by pressure tests of the receptacles bodies, performed at random according to statistical test plans.

All elements of this quality proof are part of quality management systems approved and audited by the competent authority.

The positive experiences with this alternative quality control procedures gained over years justify the adaption of the regulatory provisions to account for the process in science and technology.

2. Proposal

It's proposed to amend chapter 6.2 as follows:

"6.2.2.1 (a) Each receptacle shall be subjected to a test performed in a hot water bath, the temperature of the bath and the duration of the test shall be such that the internal pressure reaches that which would be reached at 55°C (50°C if the liquid phase does not exceed 95% of the capacity of the receptacle at 50°C). If the contents are sensitive to heat or if the receptacles are made of plastics material which softens at this test temperature, the temperature of the bath shall be set at between 20 °C and 30°C but, in addition, one receptacle in 2000 shall be tested at the higher temperature.

6.2.2.1 (b) No leakage or permanent deformation of a recaptacle may occur, except that a plastics recaptacle may be deformed through softening provided that it does not leak.

6.2.2.2 (a) Alternatively to 6.2.2.1, the leakproofness of the receptacles may be tested under a quality management system, approved by the competent authority, including a test method with a sensitivity of 2 10^{-2} mbar l/s for a reference temperature of the contents of 20° C, or of 1 10^{-2} mbar l/s for a reference temperature of 50° C, or an interpolated value for other temperatures.

As far as the test method works at temperatures of less than 50°C it shall be completed by a 100% mass control of the filled receptacles and an internal pressure test of the receptacles with a sampling rate of at least 1 per 2000 and with an internal pressure for a reference temperature of 50° C.

6.2.2.2 (b) No unacceptable leakages or deformations shall occur under these tests. Leakages are unacceptable, if the specified leakage rate is not complied with. Deformations are unacceptable, when they could adversaly affect transport safety and cause instability in stacks of receptacles."